



ENERGY STAR® Program Requirements for Residential Light Fixtures

DRAFT Eligibility Criteria – Version 4.0

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ENERGY STAR® Program Requirements for Residential Light Fixtures

Eligibility Criteria – Version 4.0

Below is the **DRAFT 2** product specification (Version 4.0) for ENERGY STAR qualified residential light fixtures. A product must meet all of the identified criteria if it is to be labeled as ENERGY STAR by its manufacturer.

The intent of ENERGY STAR for Residential Light Fixtures is to move consumers from traditional incandescent fixtures to fixtures that use high-quality fluorescent or other energy-efficient technologies, including motion-sensors and daylight-sensors for outdoor fixtures.

- 1) Definitions: Below is a brief definition of a light fixture and other related terms as relevant to ENERGY STAR:
 - A. ALA: American Lighting Association.
 - B. ANSI: American National Standards Institute.
 - C. APLAC: Asia Pacific Laboratory Accreditation Cooperation (NVLAP MRA Signatory).
 - D. Automatic Daylight Shutoff: A device (e.g., a photocell or time clock) that automatically prevents operation of a fixture during daylight hours.
 - E. Ballast: A device used with an electric-discharge lamp to obtain the necessary circuit conditions (voltage, current, and waveform) for starting and operating.
 - F. Ballast Frequency: The frequency at which the ballast operates the lamp, measured in Hertz (Hz) or Kilohertz (kHz).
 - G. CIE: Commission Internationale de l'Eclairage.
 - H. Color Rendering: The effect that the spectral characteristics of the light emitted by the lamp has on the color appearance of the objects illuminated by the lamp. Color Rendering Index is measured on a scale of zero to 100, and is defined in terms of a comparison of the spectral tri-stimulus values of the objects under test illumination and a reference or standard illumination according to the recommendations of CIE Publication No. 13.3.
 - I. Compact Fluorescent Lamp: A single based fluorescent lamp with a plug-in lamp base, including multi-tube, multibend, spiral, and circline types.
 - J. Correlated Color Temperature (CCT): The actual color of the lamp is called the color temperature and is defined in terms of the spectral tri-stimulus values (color coordinates) according to the recommendations of IESNA LM-16. For color coordinates near the Black Body loci, the correlated color temperature, measured in Kelvin (K), is used.
 - K. IEC: International Electrotechnical Commission.
 - L. IESNA: Illuminating Engineering Society of North America.
 - M. ILAC: International Laboratory Accreditation Cooperation (NVLAP MRA Signatory).
 - N. Input Power: The actual total power used by all lamp(s) and ballast(s) of the light fixture during operation, as measured in watts (W).
 - O. Lamp: A generic term for a manufactured source of light. By extension, the term is also used to denote sources that radiate in the visible spectrum.

- P. Lamp Ballast Platform: A pairing of one ballast with one or more lamps that can operate simultaneously on that ballast. A unique platform is defined by the manufacturer and model number of the ballast and lamp(s) and the quantity of lamps that operate on the ballast.
- Q. Lamp Current Crest Factor: For 60Hz operation, the ratio of peak lamp current to the root mean square (RMS) lamp current. For high-frequency (HF) operation, the highest peak lamp current of the modulation envelope (when evaluated over a full line voltage cycle) to the root mean square (RMS) of the lamp current.
- R. Lampholder: A component of a fixture, which supplies power to the lamp and also holds the lamp in place.
- S. Light Fixture (Luminaire): A complete lighting unit consisting of a lamp or lamps and ballasting (when applicable) together with the parts designed to distribute the light, position and protect the lamps, and connect the lamps to the power supply.
- T. Linear Fluorescent Lamp: A double based fluorescent lamp with a plug-in lamp base, including straight shaped or U-bent types.
- U. MRA: Mutual Recognition Arrangement.
- V. NACLA: National Cooperation for Laboratory Accreditation (NVLAP MRA Signatory).
- W. NEMA: National Electrical Manufacturers Association.
- X. NFPA: The National Fire Protection Association (United States), which develops the National Electrical Code (NEC).
- Y. NRTL: Nationally Recognized Testing Laboratory Program, which is a part of OSHA's Directorate of Technical Support.
- Z. NVLAP: National Voluntary Laboratory Accreditation Program.
- AA. Optics: Include reflectors, baffles, lenses and/or diffusers, all which control the light distribution and the appearance of the lighted fixture.
- BB. OSHA: Occupational Safety & Health Administration.
- CC. Pigtail: A short piece of cable with two connectors on each end for converting between one connector type and another; also referred to as a screw-based adapter and socket adapter.
- DD. Power Factor: The active power divided by the apparent power (i.e., the product of the rms input voltage and rms input current of a ballast).
- EE. Recessed downlight retrofit kit: A non-linear lighting unit consisting of lamp(s), ballasting, optics, trim, and power supply connection designed to convert an incandescent or halogen type Insulated Ceiling (IC) or non-IC recessed downlight into an "Air-Tight" (AT) fixture that uses an energy-efficient light source.
- FF. Standardized Color Ellipse: An elliptical region of chromaticity coordinates that is defined using a centroid, a tilt angle relative to a horizontal axis, and a defined level of variance. Such a region defines what chromaticity coordinates can be acceptably associated with a target Correlated Color Temperature. For this specification, standardized color ellipses are defined using centroids based upon objective chromaticities (x,y) and tilt angles (θ) specified in Table 1 and 2 of ANSI C78.376-2001, and a defined variance of six steps.
- GG. Trim: Trim is the part of the downlight that covers the ragged edge of the ceiling cut-out. The trim may be a separate ring, or trim ring, or it may be integrated with the optics (i.e., a self-flanged reflector). Airtight or non-airtight.
- HH. UL: Underwriters Laboratories.

Note: After further consideration and in response to stakeholder comments, EPA has modified and added a number of definitions. The definitions for “Compact Fluorescent Lamp “ and “Linear Fluorescent Lamp“ now properly distinguish based on the number of *bases*, rather than the number of *ends*, that each lamp has. A definition for “Lampholder” has been added to address stakeholder confusion over the use of the term “Socket” in “Lamp/Socket Compatibility.” A definition for “Automatic Daylight Shutoff“ has been added to clarify what is required under this performance characteristic for outdoor fixtures. A definition for “Lamp Ballast Platform” has been added for clarity. This term is used within the system efficacy performance characteristic to determine the required efficacy threshold for fixtures. A definition for “Standardized Color Ellipse” has been added to supplement the new requirements related to correlated color temperature. The definition for “Lamp Current Crest Factor” has been updated to address high frequency ballasts, whereas the previous definition was only applicable to low frequency ballasts. EPA has also restored the definitions related to MRA signatories (e.g., “MRA”, “ILAC”, “APLAC”, and “NACLA”) to reflect the reinstated allowance of test data from these parties. Lastly, EPA has alphabetized the definitions for clarity.

- 2) **Qualifying Products:** The ENERGY STAR Residential Light Fixture specification covers the requirements for indoor and outdoor light fixtures and recessed downlight retrofit kits intended primarily for residential type applications. For the purposes of this ENERGY STAR specification, residential applications include single-family and multi-family dwellings (such as houses and apartments), dormitories, public or military housing, assisted-living facilities, motels and hotels, and some light commercial applications.

Exclusion of magnetic ballasts: Indoor fixtures that include magnetic ballasts cannot qualify for ENERGY STAR under this Version 4.0 specification. Only outdoor fixtures that use high intensity discharge (HID) lamps, such as metal halide and high pressure sodium, may continue to use magnetic ballasts.

Note: Some stakeholders have expressed concern about excluding magnetic ballasts from all fixtures, except outdoor fixtures with HID lamps, despite the lower cost of magnetic products and the longer potential life of magnetic ballasts. EPA acknowledges such concerns, but must balance these with the potential benefits of electronic ballasts, including shorter start time, decreased noise production, higher potential efficiency, and compliance with requirements established by state codes. In addition, EPA has implemented more stringent thermal requirements within the current Version 3.2 specification to help ensure that electronic ballasts achieve their potential life.

Temporary allowance for decorative LEDs: EPA encourages the use of innovative light source technologies such as LEDs. LEDs used as decorative lighting elements in residential lighting fixtures and ceiling fan light kits are allowed as long as the total wattage of the LEDs does not exceed five (5) watts, the average LED system (LED and driver) efficacy is at least 20 lumens per watt, and the LED is used to supplement a primary light source that meets all of the applicable performance characteristics outlined in the Eligibility Criteria. The ENERGY STAR Partner must supply the following LED information to EPA: total wattage consumed by all the LEDs; an LED manufacturer specification sheet that shows wattage, efficacy, lamp life, color, and lumen depreciation; and a manufacturer warranty. This is a temporary allowance for the use of LEDs; EPA plans to develop more comprehensive specifications for LED performance as the technology advances and becomes more widely used in residential applications.

Note: EPA has received stakeholder feedback requesting the allowance of LEDs as primary light sources in qualified fixtures. While EPA recognizes and encourages the use of innovative light source technologies, such as LEDs, it is EPA’s understanding that the current state of the technology will not comply with the efficacy and quality performance characteristics that are required under this specification. For this reason, EPA has created a temporary allowance for decorative LEDs. This will allow manufacturers some flexibility in designing and qualifying fixtures that use LEDs while EPA develops a more comprehensive specification for this emerging technology. EPA encourages those stakeholders that are interested in including LEDs as a primary light source to provide any information or data that might help to shape future requirements for this technology.

- 3) Energy-Efficiency Specifications for Qualifying Products: Only those products listed in Section 2 that meet the criteria below may qualify as ENERGY STAR. Specifications for qualifying **indoor fixtures** can be found in Table 1. Specifications for qualifying **recessed downlight retrofit kits** can be found in Table 1A. Specifications for qualifying **outdoor fixtures** can be found in either Table 2A – Outdoor Fixtures: Compliance Through Efficient Light Source, or Table 2B – Outdoor Fixtures: Compliance Through Reduced Operating Time.

Table 1 - Indoor Fixtures

| Performance Characteristic | ENERGY STAR Specification |
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| Note: Only electronic ballasts may be used to meet the requirements of this table. In addition, fixtures that utilize compact fluorescent lamps that do not have a plug-in base (i.e use a mogul, medium, or other screw base) are not eligible to earn the ENERGY STAR. | |
| Combined Lamp & Ballast Requirements: | |
| System Efficacy Per Lamp Ballast Platform in Lumens Per Watt (LPW) ¹ , | <p>≥ 50 LPW for all lamp types below 30 total listed lamp watts.</p> <p>≥ 60 LPW for all lamp types that are ≤ 24 inches and ≥ 30 total listed lamp watts.</p> <p>≥ 70 LPW for all lamp types that are > 24 inches and ≥ 30 total listed lamp watts.</p> |
| Lamp Requirements: | |
| Lamp Life | <p>For lamps shipped with the fixtures, the average rated life of the lamp must be ≥ 10,000 hours.</p> <p>If the lamp is not shipped with the fixture, product packaging must meet the requirements set forth in the “Product Packaging for Consumer Awareness” section of this Table.</p> |
| Lumen Maintenance | For lamps indicated on the fixture packaging or shipped with the fixtures, the lamp shall have an average rated lumen maintenance of at least 80% of initial lamp lumens at 40% rated lamp life. |
| <div style="border: 1px solid black; padding: 5px;"> <p>Note: EPA has received stakeholder feedback requesting that circline lamps be allowed to maintain an average rated lumen maintenance of at least 70%, rather than the 80% value required for other lamp types. It is EPA’s understanding that circline lamps with a CRI of 80 or higher, as is required by this specification, commonly meet the proposed 80% value. Based on this information, no exemption has been made.</p> </div> | |
| Color Rendering Index | <p>For lamps shipped with the fixtures, the color rendering index must meet the following requirements:</p> <p>> 80 for compact fluorescent lamps.</p> |

¹ Efficacy shall be determined by the following equation:

$$\text{Efficacy [Lumens per Watt]} = \frac{\text{Measured Lamp Lumens [Lumens]}}{\text{Measured Input Power [Watts]}}$$

Lamp Lumens: Lamp lumens must be measured using the lamp and ballast that are shipped with the fixture.

Input Power: Input power must be measured with the lamp and ballast that are shipped with the fixture.

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| | <p>> 75 for linear fluorescent lamps.</p> <p>If the lamp is not shipped with the fixture, product packaging must meet the requirements set forth in the “Product Packaging for Consumer Awareness” section of this Table.</p> |
| Correlated Color Temperature | <p>For lamps shipped with the fixtures, the lamps must have one of the following designated correlated color temperatures (CCT): 2700K, 3000K, 3500K, 4100K, 5000K, or 6500K.</p> <p>If the lamp is not shipped with the fixture, product packaging must meet the requirements set forth in the “Product Packaging for Consumer Awareness” section of this Table.</p> <div data-bbox="237 573 1432 888" style="border: 1px solid black; padding: 5px;"> <p>Note: Stakeholders have requested that CCT’s not based upon ANSI standardized color ovals (e.g., 2600K, 2800K, 2900K, and IEC 2700K) be allowed within this specification. While EPA is not opposed to supporting a broad color palette for lamps, it believes that allowing nominal CCT’s that have overlapping standardized color ellipses will result in consumer confusion.</p> <p>In addition, the lamp production quality requirements that were previously contained within this section were moved to Table 3, below. This relocation was done because EPA felt that these requirements were more closely related to the documentation requirements included in Table 3 as opposed to required performance characteristics provided in this table.</p> </div> |
| Lamp/Lampholder Compatibility | <p>For lamps indicated on the fixture packaging or shipped with the fixtures, lamps must utilize an ANSI/IEC standardized lamp base configuration, as defined by ANSI C81.61 and IEC 60061-1.</p> <p>The lampholder must be designed to accept lamps with ANSI/IEC standardized lamp base configurations for all applicable wattages. For example, if the ballast can operate lamps with multiple wattages (e.g., an 18W, 26W, or 32W lamp) then the lampholder must be designed to accept lamps with ANSI/IEC standardized lamp base configurations for all three applicable wattages.</p> <p>In addition, lamps shall either:</p> <ul style="list-style-type: none"> • Meet the requirements of an ANSI/IEC standardized lamp specification sheet, as defined by ANSI C78.901-2001 and IEC 60901 (for compact fluorescent lamps) or ANSI C78.81-2001 and IEC 60081 (for linear lamps) if an applicable standard exists, or, • If no ANSI/IEC lamp standard exists (e.g., a spiral compact fluorescent lamp), a custom lamp specification sheet must be provided at the time of submittal. Specific lamp characteristics that should be included in the lamp specification sheet are detailed in Table 3. |

Note: A number of stakeholders indicated that the use of the word “Socket” in “Lamp/Socket Compatibility” is ambiguous and may incorrectly imply the connection between the ballast and line voltage. For this reason, EPA has changed the term “Lamp/Socket Compatibility” to “Lamp/Lampholder Compatibility.” An identical change has been made to Table 2A.

In addition, some stakeholders suggested that a consumer-oriented lamp identification system be implemented so that consumers can easily assess and purchase lamps that will be compatible with qualified fixtures. While EPA believes that a consumer-oriented lamp identification system would be ideal, such a system does not currently exist. It is not EPA’s intention to delay the revisions to this specification to conduct the necessary research needed to develop a new identification system. Meanwhile, EPA feels that the requirements above sufficiently address compatibility issues.

Lamp Labeling Requirement

For lamps shipped with fixtures, the lamp manufacturer and model number must be labeled on the lamp base, along with either the ANSI generic lamp designation, including a color designation (e.g., 830), or the wattage, the correlated color temperature, and the color rendering index.

Note: Stakeholders have suggested that additional information, besides lamp manufacturer and model number, should be provided to assist consumers with selecting replacement lamps. After further consideration and in response to stakeholder comments, EPA has added the requirement that an ANSI generic designation, including a color designation, or the wattage, CCT, and CRI values be included on the lamp base label. EPA believes that this additional information should provide a consumer with the necessary information to properly select a replacement lamp in the future.

Electronic Ballast Requirements

(Note: Magnetic Ballasts May Not Be Used in Indoor Fixtures):

General

Per ANSI C82.11 Section 5 except paragraph 5.3.1.

Lamp Start Time

The time needed after switching on the lamp to start continuously and remain illuminated must be an average of one second or less.

Note: Stakeholder feedback indicated that lamp start time is solely based upon the performance of the ballast and not the performance of the lamp and ballast combination. Based upon this comment, EPA relocated the performance characteristic to this section of the table.

Noise

Class A sound rating for electronic ballasts within the fixture, not to exceed a measured level of 24 dBA (audible) when the ballast is installed in the fixture.

Note: Stakeholders have suggested that the noise requirements in the previous specification incorrectly implied that ballast noise should be assessed when the ballast is located outside rather than inside of the fixture. In response to this feedback, EPA has revised the requirements to clearly state that noise levels should be measured while the ballast is installed within rather than outside of the fixture. In addition, the previous Draft 1 version made reference to an ambient noise level of 20 dBA. This reference was unnecessary for the purpose of defining the noise performance characteristic and has been removed.

Power Factor

≥ 0.5

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| Lamp Current Crest Factor | ≤ 1.7 |
| Maximum Measured Ballast Case Temperature During Normal Operation Inside Fixture(s) | <p><u>Not</u> to exceed the ballast manufacturer maximum recommended ballast case temperature during normal operation inside a fixture.</p> <p>Note: This performance characteristic is separate and distinct from thermal requirements established by UL, which governs safety rather than longevity of the ballast. All qualified fixtures are expected to meet this requirement, including linear, suspended, close-to-ceiling, IC, ICAT and Non-IC recessed canisters, etc. as well as those fixtures that may be exempt from UL1598.</p> |
| <p>Note: EPA considered stakeholder concerns regarding the maximum case temperature proposed in Draft 1 and has eliminated the 75°C limit. Ballasts will continue to be held to the maximum recommended ballast case temperature determined by the ballast manufacturer. EPA agrees with comments made that limiting the temperature to a particular value will not inherently ensure increased quality of ballasts and that ballast manufacturers can best assess the proper recommended temperature, based upon the design of each individual ballast. In response to stakeholder comments that implied that the intent of this requirement is not universally understood, EPA has also expanded the note that accompanies this performance characteristic. It is EPA's hope that it is now clear to manufacturers that thermal limits established by UL to address safety concerns are separate and distinct from thermal limits established by ballast manufacturers to ensure long operating life of the ballast.</p> | |
| Electromagnetic and Radio Frequency Interference | Ballast must meet FCC requirements for consumer use (FCC 47 CFR Part 18 Consumer Emission Limits) |
| Ballast Frequency | 20 to 33 kHz or ≥ 40 kHz |
| Transient Protection | Per ANSI C82.11b, paragraph 5.10.1 (100kHz Ring Wave, 2.5kV, both common mode and differential mode, 7 strikes) |
| End of Life Protection | All ballasts that operate lamps sized T5 and smaller must contain an end of life protection circuit. For ballasts that operate multiple lamps and are required to have an end of life protection circuit, the ballast must only shut down the lamp that has reached end of life, rather than shutting down all lamps. |
| <p>Note: In the previous Draft 1 version, the documentation required for this performance characteristic was included within this table. EPA has relocated these requirements to the more appropriate Table 3: Reference Standards and Required Documentation. In addition, to prevent consumer confusion, EPA has added the requirement that ballasts operating multiple lamps and requiring an end of life protection circuit must only shut down the lamp that has reached end of life.</p> | |
| Dimming | <p>Torchiere style portable fixtures shall be dimmable from 100% to 30%, or less, of maximum light output, or be switchable to three levels of brightness, not including the off position.</p> <p>Other fixture types that utilize dimmable ballasts shall be dimmable from 100% to 30%, or less, of maximum light output, or be switchable to three levels of brightness, not including the off position.</p> |
| Safety - Ballasts and "Non Edison base Fluorescent Adapters" | The cover page of a safety test report or a general coverage statement must be provided to demonstrate compliance with ANSI/UL 935 or UL 1993, as appropriate. |

Fixture Requirements

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| Fixture Warranty | A written warranty must be included in fixture packaging at the time of shipment, which covers repair or replacement of defective parts of the fixture housing, optics, trim and electronics (excluding the lamp) for a minimum of two years from the date of purchase. |
| Lamp Shipment Requirement | <p>All indoor fixtures must be shipped with a lamp, except for the following fixture types:</p> <ol style="list-style-type: none"> 1. Recessed downlight fixtures and recessed downlight retrofit kits 2. Fixtures using linear fluorescent lamps |
| <p>Note: Stakeholders have suggested that recessed downlight fixtures and retrofit kits should not be exempted from the lamp shipment requirement because these fixture types are especially at risk for exceeding ballast manufacturer recommended maximum ballast case temperatures. While EPA agrees that these types of fixtures are at an elevated risk, it does not believe that this exemption will negatively impact the durability of the fixture given that a lamp similar in wattage and type to the one tested will have to be selected for operation. EPA continues to believe that such exemptions are warranted due to the fact that, unlike most other qualified fixtures, these fixture types rarely ship with lamps.</p> | |
| Replaceable ballast | Ballasts in all fixtures (including portables) must be accessible and removable by an electrician without the cutting of wires and without damage to the fixture housing, trim, decorative elements or the carpentry (e.g., ceiling drywall) to which the fixture is attached. |
| <p>Note: In the previous Draft 1 version, documentation requirements for this performance characteristic were included within this table. EPA has relocated these documentation requirements to the more appropriate Table 3: Reference Standards and Required Documentation.</p> <p>In addition, although stakeholder comments have suggested that there is significant support for replaceable ballasts, EPA has also received concerns about the affordability of including replaceable ballasts in low-cost commodity fixtures. EPA would like additional manufacturer input on fixture categories/types where the consumer may not benefit from a replaceable ballast. If such categories exist, they need to be clearly defined in this specification so that EPA can clearly distinguish fixtures that will be required to have replaceable ballasts from those that will not. These comments are also applicable to the replaceable ballast section located in Table 2A and Table 2B.</p> | |
| Safety - Portable Fixtures | The cover page of a safety test report or a general coverage statement must be provided to demonstrate compliance with ANSI/UL 153. |
| Safety - Hardwired Fixtures | The cover page of a safety test report or a general coverage statement must be provided to demonstrate compliance with UL 1598. |
| Recessed Downlight Fixtures-Insulation Contact (IC)-Rated | Recessed downlight fixtures that are either IC-Rated for direct contact with insulation or non IC-Rated may qualify as ENERGY STAR. For fixtures to be considered IC-Rated they must be approved for zero clearance insulation cover (IC) by an OSHA NRTL. |
| <p>Note: Product packaging requirements previously included in this section are now included under the “Product Packaging for Consumer Awareness” section, below.</p> | |
| Recessed Downlight Fixtures-Air Tight (AT) For Restricted Air Movement | Recessed downlight fixtures that are either Air Tight (AT) or not AT may qualify as ENERGY STAR. For fixtures to be considered AT they must have leakage less than 2.0 cubic feet per minute (CFM) at 75 |

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| | <p>Pascals (or 1.57 lbs/ft²) when tested in accordance with ASTM E283 and shall be sealed with a gasket, caulk, or certified/listed accessory between the housing and ceiling.</p> <p>For recessed downlight fixtures that are AT, the following measures must be taken to ensure that fixtures can be properly installed and inspected:</p> <ol style="list-style-type: none"> 1. Product packaging must meet the requirements set forth in the “Product Packaging for Consumer Awareness Requirements” section below. 2. The fixture itself must include a label certifying airtight or similar designation to show air leakage less than 2.0 CFM at 75 Pascals when tested in accordance with ASTM E283. The label must be clearly visible to a building inspector. 3. Installation instructions must be included showing all components of the assembly that will be necessary to ensure an airtight installation and how the components should be properly installed. For example, depending on the method used to achieve air-tight operation, the instructions should alternatively show how a gasket is to be attached, what type of caulk to use and how it should be applied, or which certified airtight trim kits are designed to be installed with the luminaire housing. |
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Note: According to stakeholder feedback, measures should be taken in addition to testing to ASTM E283 to ensure that air-tight operation of a fixture is achieved and easily recognized by the consumer and/or contractor. To address this concern, EPA has expanded this section by requiring that the fixture itself be labeled as “air-tight” and that installation instructions showing how to properly perform the installation are included within the fixture packaging. Similar changes have been made to this performance characteristic in Table 1A, below.

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| <p>Product Packaging for Consumer Awareness Requirements</p> | <p>For fixtures that are not shipped with lamps, product packaging must include a list of lamps types that would ensure ENERGY STAR quality and performance when paired with the qualifying fixture. This list must be clearly visible to the consumer on the fixture packaging. Manufacturers are not required to provide specific lamp manufacturer names and model numbers on the packaging. Rather, generic lamp listings, such as the NEMA or ANSI generic descriptions including a color designation (e.g., F32T8/830 or CFQ26W/G24q/827), will suffice. In addition, packaging should suggest that consumers select a lamp with a rated life of 10,000 hours or more. Note: only recessed downlight fixtures, recessed downlight retrofit kits, and fixtures using linear lamps may ship without a lamp.</p> <p>For fixtures that are shipped with lamps, product packaging language is required that clearly describes the nominal color designation of the lamp in units of Kelvin (i.e., 2700K, 3000K, 3500K, 4100K, 5000K, or 6500K).</p> <p>For recessed downlight fixtures that are IC-Rated, product packaging must clearly state this rating. The language must be clearly visible on the product packaging. The IC-Rated designation will also be included in the fixture description included in the Qualified Product list posted on the ENERGY STAR Web site. Sample language: “IC-Rated for direct contact with insulation”.</p> |
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For recessed downlight fixtures that are Air-Tight (AT) rated, product packaging must clearly show that the fixture produces less air leakage than 2.0 CFM at 75 Pascals when tested in accordance with ASTM E283. The language must be clearly visible on the product packaging. The AT designation will also be included in the fixture description included in the Qualified Product list posted on the ENERGY STAR Web site. Sample language: “Certified Air Tight per ASTM E283.”

Note: After further consideration and in response to stakeholder concern, EPA has eliminated the requirement that specific lamp manufacturer and model numbers must be listed on the product packaging. The requirement within the current Version 3.2 specification, allowing NEMA or ANSI generic descriptions to be used, has been reinstated. EPA understands that no system currently exists that would allow manufacturers to easily designate, and consumers to easily find, lamps intended for use with a particular fixture. It is EPA’s hope that an effort will be made by industry stakeholders to develop such a system for inclusion in future specification revisions.

Table 1A – Additional Requirements for Indoor Recessed Downlight Retrofit Kits

| Performance Characteristic | ENERGY STAR Specification |
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| Note: The following ENERGY STAR performance requirements must be met by recessed downlight retrofit kits in addition to those listed in Table 1 – Indoor Fixtures, above. | |
| Reflectors | Reflectors must be included to maximize fixture efficiency. |
| Aperture | Maximum 7.0” |
| Air Tight (AT) For Restricted Air Movement | <p>Only recessed downlight retrofit kits that are Air Tight (AT) may qualify as ENERGY STAR. For fixtures to be considered AT they must have leakage less than 2.0 cubic feet per minute (CFM) at 75 Pascals (or 1.57 lbs/ft²) when tested in accordance with ASTM E283 and shall be sealed with a gasket, caulk, or certified/listed accessory between the housing and ceiling.</p> <p>For recessed downlight fixtures that are AT, the following measures must be taken to ensure that fixtures can be properly installed and inspected:</p> <ol style="list-style-type: none"> 1. Product packaging must meet the requirements set forth in the “Product Packaging for Consumer Awareness” section within this table, below. 2. The fixture itself must include a label certifying airtight or similar designation to show air leakage less than 2.0 CFM at 75 Pascals when tested in accordance with ASTM E283. The label must be clearly visible to a building inspector. 3. Installation instructions must be included showing all components of the assembly that will be necessary to ensure an airtight installation and how the components should be properly installed. For example, depending on the method used to achieve air-tight operation, the instructions should alternatively show how a gasket is to be attached, what type of caulk to use and how it should be applied, or which certified airtight trim kits are designed to be installed with the luminaire housing. |

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| <p>Note: The current Version 3.2 specification requires all retrofit kits to be AT-rated. In the previous Draft 1 version of this Version 4.0 specification, the requirement was made stronger by requiring AT- rated fixtures to be compliant with ASTM E283. However, while revising this section some of the language was inadvertently changed allowing both AT and non-AT kits to qualify for ENERGY STAR. It is EPA's intent to only allow AT-rated retrofit kits to qualify as ENERGY STAR and therefore, the first sentence of this section has been changed to reflect this.</p> | |
| Electrical Connections | Edison lamp socket with wire "pigtail" to the ballast. |
| Safety - Fixture Conversions, Retrofits | <p>Fixtures must be tested and listed by an OSHA NRTL as acceptable for compliance with NFPA 70, National Electrical Code (NEC).</p> <p>The cover page of a safety test report or a general coverage statement must be provided to demonstrate compliance with UL 1598 and UL 1598B.</p> |
| Product Packaging for Consumer Awareness Requirements | <p>Recessed downlight retrofit kit packaging and instructions must clearly indicate:</p> <ol style="list-style-type: none"> 1. What fixture model numbers the recessed downlight retrofit kits are compatible with. 2. Whether or not the product is dimmable. If dimmable, user instructions must clearly indicate what type of dimming circuit it can be used on. 3. Any known incompatibility with photo controls, dimmers or timing devices. 4. Airtight or similar designation to show air leakage less than 2.0 CFM at 75 Pascals when tested in accordance with ASTM E283. The language must be clearly visible on the product packaging. The AT designation will also be included in the fixture description included in the Qualified Product list posted on the ENERGY STAR Web site. Sample language: "Certified Air Tight per ASTM E283." |

Table 2A – Outdoor Fixtures: Compliance Through Efficient Light Source

| Performance Characteristic | ENERGY STAR Specification |
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| <p>Note: Only electronic ballasts may be used to meet the requirements of this table with the exception of high intensity discharge lamps, such as metal halide or high pressure sodium lamps. In these cases magnetic ballasts can still be used. In addition, fixtures that utilize compact fluorescent lamps that do not have a plug-in base (i.e use a mogul, medium, or other screw base) are not eligible to earn the ENERGY STAR. For example, a screw-based compact fluorescent lamp may not be used, though a metal halide lamp may be used.</p> | |
| <p>Combined Lamp & Ballast Requirements:</p> | |
| System Efficacy Per Lamp Ballast Platform in Lumens Per Watt (LPW) | <p>≥ 40 LPW for all lamp types below 15 total listed lamp watts.</p> <p>≥ 50 LPW for all lamp types over 15 total listed lamp watts up to 30 total</p> |

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| | <p>listed lamp watts</p> <p>≥ 60 LPW for all lamp types over 30 total listed lamp watts</p> |
| Lamp Requirements: | |
| Lamp Life | <p>For lamps shipped with the fixtures, the average rated life of the lamp must be ≥10,000 hours.</p> <p>If the lamp is not shipped with the fixture, product packaging must meet the requirements set forth in the “Product Packaging for Consumer Awareness” section of this Table.</p> |
| Lamp/Lampholder Compatibility | <p>For lamps indicated on the fixture packaging or shipped with the fixtures, lamps must utilize an ANSI/IEC standardized lamp base configuration, as defined by ANSI C81.61 and IEC 60061-1.</p> <p>The lampholder must be designed to accept lamps with ANSI/IEC standardized lamp base configurations for all applicable wattages. For example, if the ballast can operate lamps with multiple wattages (e.g., an 18W, 26W, or 32W lamp) then the lampholder must be designed to accept lamps with ANSI/IEC standardized lamp base configurations for all three applicable wattages.</p> <p>In addition, lamps shall either:</p> <ul style="list-style-type: none"> • Meet the requirements of an ANSI/IEC standardized lamp specification sheet, as defined by ANSI C78.901-2001 and IEC 60901 (for compact fluorescent lamps) or ANSI C78.81-2001 and IEC 60081 (for linear lamps) if an applicable standard exists, or, • If no ANSI-IEC lamp standard exists (e.g., a spiral compact fluorescent lamp), a custom lamp specification sheet must be provided at the time of submittal. Specific lamp and lamp base characteristics that should be included in the lamp specification sheet are detailed in Table 3. |
| Ballast Requirements: | |
| Electromagnetic and Radio Frequency Interference | Ballast must be FCC rated for consumer use (FCC 47 CFR Part 18 Consumer Emission Limits). |
| End of Life Protection | All ballasts that operate lamps sized T5 and smaller must contain an end of life protection circuit. For ballasts that operate multiple lamps and are required to have an end of life protection circuit, the ballast must only shut down the lamp that has reached end of life, rather than shutting down all lamps. |
| <div style="border: 1px solid black; padding: 5px;"> <p>Note: In this Draft 2 version of the specification, EPA is now requiring that outdoor fixtures meet the same end of life requirements as indoor fixtures. By adding this requirement, EPA feels that it will help ensure the safe operation of an outdoor fixture.</p> </div> | |
| Fixture Requirements: | |
| Maximum Input Power | 150 watts |

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| Automatic Daylight Shutoff | The fixture must contain an integrated photosensor or time clock that automatically prevents operation during daylight hours. In addition, the control must automatically reactivate within 24 hours of a manual override or testing operation. |
| <p>Note: In response to stakeholder concerns regarding the terminology used for this performance characteristic, EPA has changed it from “Controls – Time of Day” to “Automatic Daylight Shutoff.” In addition, EPA has included additional guidance to clearly state that a fixture-integrated photocell or timeclock device that automatically prevents operation of the fixture during daylight hours is required.</p> <p>Product packaging requirements have been moved to the “Product Packaging for Consumer Awareness” section within this Table, below. These changes are carried through Tables 2A, 2B and 3 in this specification.</p> | |
| Fixture Warranty | A written warranty must be included in fixture packaging at shipment, which covers repair or replacement of defective parts of the fixture housing or electronics (excluding the lamp) for a minimum of two years from the date of purchase. |
| Replaceable ballast | Ballasts must be accessible to and removable by an electrician without the cutting of wires and without damage to the fixture housing, trim, decorative elements or the carpentry (e.g. ceiling drywall) to which the fixture is attached. |
| Safety | Fixtures must be compliant with NFPA 70, the National Electrical Code (NEC), including requirements for wet or damp locations (Articles 410-4a and Article 100). |
| Product Packaging for Consumer Awareness Requirements | <p>For fixtures that are not shipped with lamps, product packaging must include a list of lamp types that would provide ENERGY STAR quality and performance when paired with the qualifying fixtures. This list must be clearly visible to the consumer on the fixture packaging. Manufacturers are not required to provide specific lamp manufacturer names and model numbers on the packaging. Rather, generic lamp listings, such as the NEMA or ANSI generic descriptions including a color designation (e.g., F32T8/830 or CFQ26W/G24q/827), will suffice. In addition, consumers should be directed to select a lamp with a rated life of 10,000 hours or more.</p> <p>Product packaging must indicate the minimum (lowest) starting temperature for the lamp and ballast platform of the fixture.</p> <p>If the automatic daylight shutoff control can be adjusted such that the fixture can operate during full daylight, or automatic reactivation will not occur within 24 hours of a manual override or testing operation, additional packaging language is required that provides a range of settings that will result in the fixture complying with the specification. The language must be clearly visible to the consumer on the fixture packaging and in the fixture manual. Sample language: “To meet ENERGY STAR requirements the photosensor control knob must be set to x, y, or z to prevent operation during full daylight.”</p> |

Note: EPA has eliminated the requirement that specific lamp manufacturer and model numbers must be listed on the product packaging. The requirement within the current Version 3.2 specification, allowing NEMA or ANSI generic descriptions to be used, has been reinstated. EPA understands that no system currently exists that would allow manufacturers to easily designate, and consumers to easily find, lamps intended for use with a particular fixture. It is EPA's hope that an effort will be made by industry stakeholders to develop such a system for inclusion in future specification revisions. Unlike the change to the requirements for indoor fixtures, all types of outdoor fixtures may continue to ship with or without a lamp at the discretion of the manufacturer. This change is also reflected in Table 2B, below. In addition, EPA has consolidated all product packaging requirements for this Table into one section, titled "Product Packaging for Consumer Awareness Requirements." EPA believes that this will help ensure that Partners do not overlook certain requirements. Lastly, the labeling of minimum starting temperature was added to address builder and consumer need to be able to identify fixtures that will operate sufficiently in colder weather.

Note Regarding Previous Table 2A Special Application – Outdoor Fixtures Installed on a Daylight-Controlled Circuit: Stakeholders expressed concern about the continued qualification of outdoor fixtures without integrated photocells, which could cause consumer confusion. In addition, it was suggested to EPA that the more stringent product packaging requirements proposed in Draft 1 are unworkable. Based upon this feedback and due to market abuse, this exemption has been eliminated from the specification. EPA welcomes feedback from stakeholders that continue to find value in this exemption and would be interested in reviewing any proposals for ensuring that consumers are made aware that photocontrols must be purchased separately and that such fixtures are not intended for purchase by general homeowners, but are rather intended for use on multi-tenant residential buildings such as apartments.

Table 2B - Outdoor Fixtures: Compliance Through Reduced Operating Time

| Performance Characteristic | ENERGY STAR Specification |
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| Note: All lamp types (fluorescent, incandescent, etc.) may be used to meet the requirements set forth in this table. | |
| Fixture Requirements: | |
| Maximum Input Power | 250 watts |
| Automatic Daylight Shutoff | The fixture must contain an integrated photosensor or time clock that automatically prevents operation during daylight hours. In addition, the control must automatically reactivate within 24 hours of a manual override or testing operation. |
| Motion Control | The fixture must contain an integrated motion sensor that employs infrared sensing technology. The sensor must: <ul style="list-style-type: none"> allow automatic shut-off of the lamp within 15 minutes of being manually activated by a switch or automatically activated by the sensor, and automatically reset to sensing mode within 24 hours of a manual override or testing operation. The fixture must: <ul style="list-style-type: none"> have an indicator that visibly or audibly informs the device operator that the motion sensor is operating properly, or that it has failed or malfunctioned. |

Note: EPA has changed the title of this performance characteristic from “Controls – Motion Sensor” to “Motion Control” to be consistent with the newly named Automatic Daylight Shutoff performance characteristic.

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| Fixture Warranty | A written warranty must be included in fixture packaging at shipment, which covers repair or replacement of defective parts of the fixture housing or electronics (excluding the lamp) for a minimum of two years from the date of purchase. |
| Replaceable ballast | If a ballast is present in the fixture, it must be accessible to and removable by an electrician without the cutting of wires and without damage to the fixture housing, trim, decorative elements or the carpentry (e.g., ceiling drywall) to which the fixture is attached. |
| Safety | Fixtures must be compliant with NFPA 70, the National Electrical Code (NEC), including requirements for wet or damp locations (Articles 410-4a and Article 100). |
| Product Packaging for Consumer Awareness Requirements | <p>If the automatic daylight shutoff control can be adjusted such that the fixture can operate during full daylight, or automatic reactivation will not occur within 24 hours of a manual override or testing operation, product packaging language is required that provides a range of settings that will result in the fixture complying with the specification. The language must be clearly visible to the consumer on the fixture packaging and in the fixture manual. Sample language: “To meet ENERGY STAR requirements the photosensor control knob must be set to x, y, or z to prevent operation during full daylight.”</p> <p>If the integrated motion sensor can be adjusted such that shut-off will not occur within 15 minutes or automatic reset to sensing mode will not occur within 24 hours of a manual override or testing operation, product packaging must provide a range of settings that will resulting the fixture complying with the specification. The language must be clearly visible to the consumer on the fixture packaging and in the fixture manual. Sample language: “To meet ENERGY STAR requirements, the motion sensor control knob must be set to x, y, or z to allow automatic reset of the sensor”. In addition, the fixture must include instructions within the packaging that outlines step-by-step calibration instructions for the motion sensor.</p> |

- 4) Qualification Process, Acceptable Testing Facilities, Testing Standards & Required Documentation:
 The following section describes the steps required to qualify residential light fixtures as ENERGY STAR, provides information about acceptable testing facilities, and states the testing standards and documentation required for each performance characteristic.

Steps for Partners to Qualify Residential Light Fixtures for ENERGY STAR

To qualify a residential lighting fixture as ENERGY STAR, it must be tested according to the protocol outlined below. **Note: EPA reserves the right to require additional documentation, at any time, in order to determine compliance with all performance characteristics.**

- A. Partner must test qualifying products and obtain required documentation to meet the performance characteristics listed in Section 3 of this specification. Refer to Table 3, below, to determine the reference standard and required documentation applicable to each performance characteristic.

The following stipulations apply:

- For performance characteristics that require testing, the minimum required sample size is three units for each lamp/ballast combination, unless otherwise noted such as lamp specific parameters that require 10 lamp samples.
 - For multiple fixture models that use the same lamp/ballast combination, only one set of test results is required. For example, two fixtures that use the same lamp and ballast combination, but have different trim, lens and/or chase need only be tested once.
 - For fixture models that may use different ballasts (either in terms of the type of ballast or manufacturer), each lamp/ballast combination must undergo testing and the test results must be submitted for qualification. For example, if a residential light fixture partner plans to use ballasts from several manufacturers in any one fixture, the fixture must be tested with each manufacturer's ballast.
 - For fixture models with one ballast type that can work with multiple lamp types, the fixtures need only be tested with one lamp type. The lamp type must either be the one supplied with the fixture at shipment or, if a lamp is not supplied, one of the lamp types listed on the packaging. Please note that EPA expects all lamps listed on the packaging to comply with the specification when operating on the fixture's ballast. To ease the burden on the manufacturer, however, test data need be submitted for only one lamp type operating on the fixture's ballast.
- B. Submit a signed and completed copy of the ENERGY STAR Residential Light Fixture Qualified Product Information (QPI) form along with required documentation. To obtain the current version of the form, visit the "Lighting" section of the ENERGY STAR Web site at www.energystar.gov/partners and click on "Product Specifications."

Explanation of Acceptable Testing Facilities:

- To ensure quality product in the marketplace, ENERGY STAR requires test data from a laboratory accredited by one of the following: NVLAP, a laboratory accredited through one of NVLAP's MRA signatory partners (ILAC, APLEC, NACLA), or, when appropriate, from an OSHA NRTL or a laboratory accredited by an OSHA NRTL (see Table 3 for specific requirements).

Please note that the required laboratory data for lumen output, CRI, CCT, and lamp life must come from a NVLAP accredited laboratory whose scope of accreditation includes the specific reference standards that are listed in Table 3 of this specification. Partners should obtain from the laboratory both its certificate of accreditation and its scope of accreditation and submit them to ENERGY STAR. Documentation for safety requirements must come from an OSHA NRTL. All other documentation may come from one of the accredited laboratories mentioned in the previous paragraph.

- Use the information below to locate an acceptable testing facility:
 - For a list of NVLAP accredited laboratories, visit the NVLAP Web site at <http://www.nist.gov/nvlap> or call (301) 975-4016.
 - For a list of signatories to the ILAC MRA, visit the ILAC Web site at www.ilac.org.
 - For a list of signatories to the APLAC MRA, visit the APLAC Web site at <http://www.ianz.govt.nz/aplac/>.
 - For a list of signatories to the NACLA MRA, visit the NACLA Web site at www.nacla.net.

- For a list of accredited OSHA NRTL's, visit <http://www.oshaslc.gov/dts/otpca/nrtl/index.html> or call (202) 693-2110.

Note: In response to the previous Draft 1 version, a number of stakeholders expressed their concern with EPA's decision to exclude laboratories accredited by NVLAP's MRA signatory partners (ILAC, APLAC, and NACLA) from the list of acceptable laboratories. Those that commented expressed specific concerns about the potential increase in cost and international implications. EPA understands these concerns and has reinstated the allowance of laboratories accredited through NVLAP's MRA signatory partners.

C. ENERGY STAR Partners may obtain test data through any of the following sources:

- **A public or private laboratory accredited by NVLAP or one of its MRA signatories or a public or private laboratory accredited by an OSHA NRTL.** Partner should supply laboratory test reports with a completed QPI form.
- **The original equipment manufacturer.** Partners should supply laboratory test reports or an ENERGY STAR Platform Letter of Qualification with a completed QPI form. The ENERGY STAR Platform Letters of Qualification are given to manufacturers who pre-qualified certain performance requirements for their lamp and/or ballast.
- **An industry association.** Partners should supply laboratory test reports or a letter issued by ENERGY STAR to said industry association that acknowledges the association's data sources. ENERGY STAR issues such letters to industry associations, who take responsibility for certain performance requirements of lamp/ballast combinations.

Note: Fixture manufacturers may use the NEMA-ALA Lamp and Ballast Matrices as a source for obtaining required information to qualify fixtures. These matrices can be found at <http://www.nema.org/lampballastmatrix/>.

Table 3 – Reference Standards and Required Documentation

| Performance Characteristic (refer to Tables 1, 1A, 2A or 2B as appropriate) | Methods of Measurement Reference Standards | Required Documentation (to be attached to QPI Form) |
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| System Efficacy: Light Output Input Power (Tables 1, 2A) | IESNA LM-9; LM-66; ANSI C82.2 | Laboratory test results must come from the specific lamp and ballast combination that will operate in the fixture. Provide: <ol style="list-style-type: none"> 1. a test report from a laboratory accredited by NVLAP; or 2. an EPA approved Platform Letter of Qualification that lists the lamp/ballast combination used in the fixture and the test result for this performance characteristic. <p>Note: The laboratory used for this test must be accredited by NVLAP <i>and</i> have a scope of accreditation that includes the method of measurement reference standard for this performance characteristic.</p> |
| Reflectors (Table 1A) | No Standard Available (Use manufacturer protocol) | No supplemental documentation required. |
| Lamp Start Time (Table 1) | ANSI C82.11-5.2 | Laboratory test results must come from the specific lamp and ballast combination that will operate in the fixture. Provide: <ol style="list-style-type: none"> 1. a test report from a laboratory accredited by NVLAP; or 2. an EPA approved Platform Letter of Qualification that lists the lamp/ballast combination used in the fixture and the test result for this performance characteristic; or 3. a test report from a laboratory accredited by an OSHA NRTL. |

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| <p>Lamp Life (Tables 1, 2A)</p> | <p>IESNA LM-40; LM-65; IEC 60091; IEC 60901</p> | <p>Laboratory test results must be produced using the specific lamp that will operate in the fixture and a reference ballast.</p> <p>Provide a test report from a laboratory accredited by NVLAP or an ISO 9000 registered facility that demonstrates the lamp has an average rated lamp life of at least 10,000 hours. For this test, a sample of ten or more lamps must be used.</p> <p>Manufacturers may obtain ENERGY STAR conditional qualification for their fixture if all of the following items are provided:</p> <ol style="list-style-type: none"> 1) A letter on letterhead from a NVLAP laboratory or an ISO 9000 registered facility demonstrating lamp life testing has begun. 2) A laboratory report proving that testing has been completed for at least 40% of rated life. 3) The date for testing completion. <p>Conditional approval will only be granted for a period of no longer than 325 days.</p> <p>Note: If the laboratory used for this test is accredited by NVLAP it must also have a scope of accreditation that includes the method of measurement reference standard for this performance characteristic.</p> |
| <p>Note: Stakeholders expressed concern with the cost burden of using NVLAP facilities and of testing each lamp/ballast combination that may be used within a qualified fixture. Responding to these concerns, EPA decided to revise the testing requirements above to allow facilities that are ISO 9000 registered to also conduct the tests necessary for ENERGY STAR qualification under this performance characteristic. EPA is also allowing lamp life testing to be completed using a reference ballast in place of the specific ballast that is shipped with the qualified fixture(s).</p> <p>In response to stakeholder concern that conditional qualification of fixtures based upon only 1,000 hours of testing is insufficient, EPA has extended the amount of lamp life testing for conditional approval from 1,000 hours to 40% of rated lamp life. This aligns with the amount of lumen maintenance testing that must be completed prior to qualification and EPA believes that this will help ensure that preliminary results are more indicative of true lamp life.</p> | | |
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| Lumen Maintenance (Table 1) | IESNA LM65, IESNA LM66 & ANSI C78.5 | Documentation must show the average maintained lumens at 40 percent life (4,000 hours) for a sample size of at least ten lamps. Provide a test report from a laboratory accredited by NVLAP or an ISO 9000 registered facility demonstrating that at least eight of the ten samples achieved the required lumen maintenance value. |
| <p>Note: Some stakeholders suggested that the sample size under this requirement be reduced to six lamps and requested that EPA allow previously existing test data, based upon this sample size, be eligible for compliance. However, EPA has decided to keep the ten-lamp requirement as the sample size in the interest of consistency within this specification and with ENERGY STAR CFL testing requirements. Additional clarification has been added regarding the number of samples that must meet the lumen maintenance requirement to qualify as ENERGY STAR, which is eight out of ten samples.</p> | | |
| Color Rendering Index (Table 1) | IESNA LM-58; CIE 13.3 | <p>Laboratory tests must be completed on a lamp intended for use in the fixture for a sample size of at least ten lamps.</p> <p>Provide:</p> <ol style="list-style-type: none"> 1. a test report from a laboratory accredited by NVLAP; or 2. supply an EPA approved Platform Letter of Qualification that lists the lamp/ballast combination used in the fixture and the test result for this performance characteristic. <p>Note: The laboratory used for this test must be accredited by NVLAP <i>and</i> have a scope of accreditation that includes the method of measurement reference standard for this performance characteristic.</p> |

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| <p>Correlated Color Temperature (Table 1)</p> | <p>IESNA LM-58; LM-16</p> | <p>Laboratory tests must be completed on the lamp shipped with the fixture or listed on product packaging. The specified ballast included with the fixture or a reference ballast may be used. A minimum sample size of 10 lamps must be used for the tests.</p> <p>Provide:</p> <ol style="list-style-type: none"> 1. a test report from a laboratory accredited by NVLAP or an ISO 9000 registered facility showing that 90% of the lamps tested fall within a 7-step ANSI Mac Adam ellipse; or 2. supply an EPA approved Platform Letter of Qualification that lists the lamp/ballast combination used in the fixture and the test result for this performance characteristic. <p>It is also intended that the lamp manufacturer will meet the following quality requirements during the production runs of each lamp model:</p> <ol style="list-style-type: none"> 1. The lamp manufacturer is required to maintain color control such that a minimum of 90 percent of the ongoing production (as represented by samples tested from each production shift for the same color and when typically evaluated over 12 month period) will fall within the 7 step Mac Adam color ellipse associated with the designated (manufacturer declared) target color. 2. For the purposes of meeting color control the lamp manufacturer must maintain testing equipment calibrated to international practices and standards and must compile the ongoing color control data in a manner so that is can be easily reviewed upon EPA request. 3. At a minimum, the manufacturer's color quality control program must maintain the following information for a 3-year period: |
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| | | <ul style="list-style-type: none"> a. Test dates and sample size (minimum of two lamps per production shift) b. Test results (x,y) for each sample lamp measured c. Test results (all x,y data) for sample lamps plotted graphically against the designated seven step color ellipse and available for review at least on a quarterly basis d. Records to substantiate that 90 percent of the (x,y) data points fall within the applicable seven (7) step Mac Adam ellipse. Manufacturers are encouraged to exceed this target. |
| <p>Note: Overall comments received by EPA on Draft 1 showed support for redefining the correlated color requirements using standardized color ellipses. However, some stakeholders felt that the proposal of using a two-oval methodology to determine compliance was overly complex. After further consideration, EPA has decided to adopt a proposal to redefine requirements using a single-oval methodology with seven steps of variance to determine compliance. EPA encourages stakeholders to provide comments regarding this new approach.</p> <p>In addition, EPA has provided further clarification regarding documentation requirements to address requests by stakeholders to provide more clear and detailed guidance. These requirements have also been revised to allow the use of a reference ballast and either a NVLAP accredited laboratory or an ISO 9000 registered facility for reasons provided within the Lamp Life section. above.</p> | | |
| <p>Noise (Table 1)</p> | <p>Class A sound rating for electronic ballasts within the fixture, not to exceed a measured level of 24 dBA (audible) when the ballast is installed in the fixture and is measured using a sound meter (similar in performance to B&K type 2209) where the microphone is located 12 inches from the fixture in any direction.</p> | <p>No supplemental documentation required.</p> <p>Note: A laboratory test report must be submitted upon EPA request.</p> |
| <p>Note: Some stakeholders indicated that the noise requirements provided in the previous Draft 1 version incorrectly implied that ballast noise should be assessed when the ballast is located outside rather than inside of the fixture. In response to these comments EPA has revised these requirements to clearly state that noise levels should be measured while the ballast is installed within rather than outside of the fixture. In addition, the reference to an ambient noise level has been removed.</p> | | |

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| Fixture Warranty (Tables 1, 2A, 2B) | No Standard Available (Use manufacturer protocol) | Provide a copy of the actual two-year fixture manufacturer written warranty that is included in product packaging. |
| Dimming (Table 1) | No Standard Available (Use manufacturer protocol) | No supplemental documentation required. Note: A laboratory test report proving the fixture is dimmable from 100% to 30% must be submitted upon EPA request. |
| <u>Lamp/Lampholder Compatibility:</u> (Tables 1, 2A) Lamp Base Configuration Lamps Compliant with an ANSI-IEC Standard (for lamp dimensions and electrical parameters) Lamps Not Compliant with an ANSI-IEC Standard (for lamp dimensions and electrical parameters) | ANSI C81.61; IEC 60061-1 ANSI C78.901-2001; ANSI C78.81-2001; IEC 60901; IEC 60081 ANSI C78.901-2001; ANSI C78.81-2001 (used as a reference for the format and type of information required on a custom lamp specification sheet) | Provide manufacturer data indicating the ANSI base type used. Provide manufacturer data indicating applicable ANSI lamp data sheet. Provide a manufacturer lamp specification sheet that describes the following (use the ANSI lamp data sheets found in ANSI C78.901 and C78.81 as a reference for the format and type of information requested): 1. Lamp Description, including: <ul style="list-style-type: none"> • Lamp Model Number • Nominal Wattage • Bulb Designation / Lamp Size (i.e., T4, T5, T8, etc.) • ANSI Base Type as defined by ANSI C81.61 (i.e., 2G13, GR10q, etc.) • Starting Circuit Application (i.e., rapid start, preheat, etc.) 2. Dimensional Characteristics, including diagram 3. Lamp Operating Characteristics, including: <ul style="list-style-type: none"> • Approximate wattage (W) • Voltage(V) • Current (A) |
| Lamp Labeling Requirement (Table 1) | No Standard Available (Use manufacturer protocol) | Provide a copy of the actual language that will be included on the base of the lamp. |

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| Replaceable Ballast (Tables 1, 2A, 2B) | No Standard Available (Use manufacturer protocol) | Provide a copy of the language that includes guidance on ballast replacement location and states that the ballast is replaceable with the use of a “qualified electrician.” |
| <p>Note: Draft 1 of this specification included a requirement that manufacturers provide instructions about ballast replacement to consumers. Stakeholders expressed concern that such guidance and action taken by the consumer could result in voiding a luminaire’s UL listing. EPA has revised the documentation requirements so that manufacturers are now required to include language that indicates ballast replacement be performed by a “qualified electrician.”</p> | | |
| <u>Safety: Indoor</u> <ul style="list-style-type: none"> • Portable Fixtures (Table 1) • Hardwired Fixtures (Table 1) • Ballasts and “Non-Edison based Fluorescent Adapters” (Table 1) • Fixture Conversions, Retrofits (Table 1A) | ANSI/UL 153 UL 1598 ANSI/UL 935 or UL 1993 UL 1598 and UL 1598B | Provide the cover page of a safety test report or a general coverage statement from an OSHA NRTL. Provide the cover page of a safety test report or a general coverage statement from an OSHA NRTL. Provide the cover page of a safety test report or a general coverage statement from an OSHA NRTL. Provide the cover page of a safety test report or a general coverage statement from an OSHA NRTL. |
| <u>Safety: Outdoor</u> (Tables 2A & 2B) | NFPA 70, the National Electrical Code (NEC), including requirements for wet locations when applicable (Articles 410-4a and Article 100) | Provide the cover page of a safety test report or a general coverage statement from an OSHA NRTL. Including evidence of the Rain Test for Wet Location when applicable. |
| Power Factor (Table 1) | ANSI C82.11-3.3.1 | Provide: <ol style="list-style-type: none"> 1. a test report from a laboratory accredited by NVLAP; or 2. an EPA approved Platform Letter of Qualification that lists the lamp/ballast combination used in the fixture and the test result for this performance characteristic; or 3. a test report from the manufacturer <p>Note: A laboratory test report must be submitted upon EPA request.</p> |

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| <p>Lamp Current Crest Factor (Table 1)</p> | <p>ANSI C82.11-3.3.3 and 5.6 ANSI C82.1-5.6.1</p> | <p>Laboratory testing must be completed using the ballast that is shipped with the fixture.</p> <p>Provide:</p> <ol style="list-style-type: none"> 1. a test report from a laboratory accredited by NVLAP; or 2. an EPA approved Platform Letter of Qualification that lists the lamp/ballast combination used in the fixture and the test result for this performance characteristic; or 3. a test report from a laboratory accredited by an OSHA NRTL. |
| <p>Measured Maximum Ballast Case Temperature During Normal Operation Inside Fixture(s) (Table 1)</p> | <p>UL 1598, Section 11 (Acceptable when the thermocouple is placed at the hot-spot location indicated by the ballast manufacturer.)</p> <p style="text-align: center;">-OR-</p> <p>Lighting Research Center (LRC) "Proposed Durability Testing Method: Temperature" available at http://www.lrc.rpi.edu/programs/lightingTransformation/pdf/durabilityTestingFinalReport.pdf</p> <p>Note: All qualified fixtures are expected to meet the Measured Maximum Ballast Case Temperature During Normal Operation Inside Fixture(s) requirement. This includes every qualified fixture including linear, suspended, close-to-ceiling, IC, ICAT and Non-IC recessed canisters, etc. as well as those fixtures that may be exempt from UL1598.</p> | <p>The supplemental documentation should include the following:</p> <ul style="list-style-type: none"> • Fixture model(s) tested • Lamp model(s) and ballast model(s) tested • Measured maximum ballast case temperatures • Ambient temperature • Test procedure, including description of fixture installation, thermocouple location(s), and time that elapsed before readings were taken. • Ballast Manufacturer Maximum Recommended Case Temperature During Normal Operation Inside the Fixture(s) • Ballast Hot Spot Location Diagram from the ballast manufacturer <p>Provide a test report from:</p> <ol style="list-style-type: none"> 1. a laboratory accredited by an OSHA NRTL, 2. a laboratory accredited by NVLAP; or 3. the manufacturer |
| <p>Note: In response to stakeholder requests, EPA has provided a new URL that directly links to LRC's "Proposed Durability Testing Method: Temperature" document, referenced above.</p> | | |

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| Electromagnetic and Radio Frequency Interference (Tables 1, 2A) | Consumer Limits Per FCC 47 CFR Part 18.305 and 18.307 | No supplemental documentation required. Note: A laboratory test report must be submitted upon EPA request. |
| Ballast Frequency (Table 1) | Oscilloscope instruction manual | Provide: 1. a test report from a laboratory accredited by NVLAP; or 2. a test report from the manufacturer Note: A laboratory test report must be submitted upon EPA request. |
| Transient Protection (Table 1) | ANSI C82.11b, paragraph 5.10.1 | Provide: 1. a test report from a laboratory accredited by NVLAP; or 2. a test report from the manufacturer Note: A laboratory test report must be submitted upon EPA request. |
| End of Life Protection (Table 1) | IEC 61347-2-3 Amendment 1 to Edition 1 2004-06 | For all ballasts that that operate T4 and/or T5 sized lamps, provide manufacturer or lab data that demonstrate the ballast is in compliance with IEC 61347-2-3 (or ANSI C82.11-2005, upon its release). For all ballasts that operate T3 and smaller sized lamps, the manufacturer must provide a circuit diagram and an accompanying engineering description outlining the scheme that is used to achieve the end of life function within the ballast. |
| <p>Note: Stakeholders have requested that circuit diagrams and engineering descriptions not be required for ballasts that operate T4 and /or T5 sized lamps due to the fact that these products are now required to provide documentation demonstrating compliance with IEC/ANSI standards. EPA agrees that requiring both types of documentation would be redundant. Therefore, the requirement that a circuit diagram and engineering description be provided for ballasts that operate T4 and/or T5 sized lamps has been removed. However, due to the fact that the referenced IEC and ANSI standards do not encompass requirements for ballasts that operate T3 or smaller sized lamps, a circuit diagram and engineering description is still required in these cases.</p> | | |
| Aperture (Table 1A) | No Standard Available (Use manufacturer protocol) | No supplemental documentation required. |

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| Restricted Air Movement (Table 1A) | ASTM E283 | Provide: 1. a test report from a laboratory accredited by NVLAP; or 2. a test report from the manufacturer Note: A laboratory test report must be submitted upon EPA request. |
| Electrical Connections (Table 1A) | No Standard Available (Use manufacturer protocol) | Supply engineering description and/or schematic. |
| Product Packaging for Consumer Awareness Requirements (Table 1, 1A, 2A, 2A – Special Applications, & 2B) | No Standard Available (Use manufacturer protocol) | Provide a written copy or a PDF graphic of the language that will be displayed on product packaging and within the packaging, as required (i.e., installation instructions for air-tight rated fixtures). |
| Automatic Daylight Shutoff (Tables 2A, 2B) | No Standard Available (Use manufacturer protocol) | Provide applicable sections of fixture manual(s) that demonstrate controls exist for each fixture being submitted. Note: A laboratory test report must be submitted upon EPA request. |
| Motion Control (Table 2B) | No Standard Available (Use manufacturer protocol) | Provide applicable sections of fixture manual(s) that demonstrate controls exist for each fixture being submitted. Note: A laboratory test report must be submitted upon EPA request. |

5) Additional Quality Assurance Requirements: The following requirements outline a manufacturer-financed quality assurance system that will allow for independent evaluation of ENERGY STAR qualified fixtures. These requirements will go into effect on the effective date listed below in Section 6. Upon the effective date, EPA may start requesting manufacturers to submit products for quality assurance testing as described below. EPA reserves the right to modify these procedures from time to time based on experience gained in their implementation.

1. **Quality Assurance Testing**: EPA will select fixtures each year for quality assurance testing. The manufacturer of each selected fixture will be required to commission third-party testing of the specified fixture by a manufacturer-independent NVLAP accredited testing lab. The testing lab will procure two samples of each fixture on the open market (if possible), with the first sample used for testing and the second held in reserve should the first sample become damaged or otherwise unavailable for testing. The testing lab will evaluate some or all of the following performance characteristics for ENERGY STAR compliance:

- Lamp Lumens
- Input Power
- Efficacy
- Lamp Start Time
- Correlated Color Temperature
- Color Rendering Index
- Lamp Labeling information as written on the lamp base (e.g., model number and manufacturer, wattage, CRI, CCT, and/or NEMA generic lamp designation with color designation)
- Lamp Base Type
- Lumen Maintenance
- Maximum Ballast Operating Case Temperature
- Product Packaging

Products that fail to meet one or more elements of the ENERGY STAR specification will be addressed under EPA's delisting protocol.

Note: EPA will select no more than two (2) lamp/ballast platforms from any given manufacturer per year. Having selected the lamp/ballast platform, EPA will then select for testing one specific fixture that contains each platform.

Note: This section has been renamed "Additional Quality Assurance Requirements" to better convey EPA's intent to initiate a manufacturer-financed quality assurance system. A successful system will allow all manufacturers to share the costs and reap the benefits of maintaining the integrity and reputation of the ENERGY STAR brand as the symbol of energy efficiency and quality.

Stakeholders have expressed concern about the potential costs associated with a quality assurance program and requested that additional details be provided for this section. In response to these concerns, EPA has provided additional details about the number of fixtures that will be tested each year and the performance characteristics that may be evaluated.

In addition, Draft 1 of Version 4.0 specification included a 3-year requalification requirement. However, after stakeholder feedback, EPA decided to remove that requirement and focus on an annual quality assurance testing system.

EPA has relocated these requirements from the Future Specification Revisions section to reflect that the requirements will go into effect at the same time as this Version 4.0 specification. Therefore, EPA may request manufacturers to initiate testing beginning in October 2005. EPA has set this date to ensure that independent testing of qualified fixtures can continue once the PEARL program, which currently conducts independent testing of fixtures, is completed. While this new proposed date is earlier than originally anticipated, it is in keeping with EPA's intent to provide at least 180 days notice before implementation.

2. **Challenge Testing:** Anyone who believes that a non-compliant fixture is using the ENERGY STAR may initiate a challenge test. The challenger shall initiate the challenge by informing EPA or its designated agent of the challenge in writing; the challenge must include the manufacturer and model number of the challenged product as well as the parameter or parameters of the specification that are under challenge. EPA or its agent will select a manufacturer-independent NVLAP-accredited testing lab to conduct the testing and obtain a price quote from the lab for testing the challenged parameter(s). EPA will then request that the challenger and the manufacturer both deposit the necessary fee with the testing lab. (The challenger's failure to deposit the fee will cancel the challenge test; the manufacturer's failure to deposit the fee will be deemed equivalent to a challenge failure. The testing lab will procure two samples of each fixture on the open market (if possible), with the first sample used for testing and the second held in reserve should the first sample become damaged or otherwise unavailable for testing. The testing lab will determine compliance with the challenged specification parameter(s) and report its findings to EPA, which will forward the data to the challenger and the manufacturer. In the event that the fixture meets the challenged parameter(s), the fixture remains qualified and the manufacturer's payment will be returned to the manufacturer. In the event that the fixture fails any of the challenged parameter(s), the challenger's payment will be returned to the challenger. Products that fail to meet one or more elements of the ENERGY STAR specification will be addressed under EPA's delisting protocol.
- 6) **Effective Date:** The date that all ENERGY STAR qualified residential lighting fixtures must meet Version 4.0 will be defined as the *effective date* of the agreement. The ENERGY STAR Version 4.0 Eligibility Criteria (aka Specification) for Residential Light Fixtures shall go into effect on **October 1, 2005**. Any previously executed agreement on the subject of ENERGY STAR qualified residential light fixtures shall be terminated effective September 30, 2005.
- A. **Qualifying and Labeling Products under the Version 4.0 Specification:** All products, including models originally qualified prior to Version 4.0 with a **date of manufacture** after **October 1, 2005**, must meet the new Version 4.0 requirements in order to use the ENERGY STAR on the product or in product literature. The date of manufacture is specific to each unit, and is the date (e.g., month and year) of which a unit is considered to be completely assembled. Manufacturers may begin to test and submit products under Version 4.0 upon EPA's release of the Final specification document.
- B. **Elimination of Automatic Grandfathering:** EPA does not allow grandfathering under this Version 4.0 specification. Therefore, any product sold, marketed, or identified by the manufacturing partner as ENERGY STAR must meet the current specification in effect at that time.
- 7) **Future Specification Revisions:** ENERGY STAR reserves the right to change the specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment. In keeping with current policy, revisions to the specification will be arrived at through industry discussions.

Expiration of ENERGY STAR Qualification: During future specification revisions EPA may choose to require complete new test data (i.e., test data that has been obtained within the six months prior to submitting the fixture for re-qualification) and documentation for all performance characteristics in order for the fixture to remain ENERGY STAR qualified. New test data may be required for new, revised and/or existing ENERGY STAR performance characteristics.

Note: Draft 1 of the Version 4.0 specification proposed that a fixture's ENERGY STAR qualification would automatically expire every three years. Stakeholders expressed concern about the costs associated with re-qualifying fixtures three years after initial qualification. In addition, stakeholders expressed concern about undue testing redundancy if the specification is revised every two to three years. After further consideration, EPA has decided to remove the requirement for periodic requalification, although EPA may require all new test data when the specification is revised.

Ballast Accelerated Life Testing: To further guarantee that electronic ballasts achieve their potential life, EPA intends to work with industry to develop and implement a ballast accelerated life test requirement in future revisions of the specification.

Line-Voltage Socket Standardization: EPA has worked with industry to develop a line-voltage socket standard for use in residential lighting fixtures. Under this Version 4.0 specification the use of this standard is voluntary for compliance with ENERGY STAR. EPA encourages manufacturers to adopt this standard for use with replaceable ballasts and intends to include a standard line-voltage socket requirement in future specification versions.

Specific technical details are located at www.XXXXXXX.com [exact URL to be provided by release of the final specification]

Self-Ballasted Pin Based Lamps : EPA will explore a future labeling program for self-ballasted pin-based lamps that utilize the standard line voltage socket.

Note: As more “twist and lock” and “plug-in” replaceable ballasts enter the market and are being used in ENERGY STAR qualified fixtures, EPA understands the need for a standard line-voltage socket (aka holder) for the ballasts. A standard line-voltage socket that is not proprietary will allow acceptance of ballasts from multiple manufacturers. This in turn will increase the number of suitable replaceable ballasts available to consumers. EPA will continue to work with industry to ensure that the line-voltage socket standard is appropriately implemented in future specifications.

While self-ballasted pin based lamps (i.e an integrated lamp and ballast with a pin-base that fits into a standard pin-based line-voltage socket) do not currently exist, EPA expects that a line-voltage socket standard will provide an opportunity for self-ballasted pin based compact lamps to be used in fixtures. If, and when, these type products become available, EPA will explore their applicability for ENERGY STAR.